

Title: BREAST CANCER INCIDENCE IS RELATED TO URANIUM PARTICULATE EXPOSURE IN A POPULATION LIVING NEAR A URANIUM REFINERY

Susan M. Pinney, *Dept. of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, OH, USA*

Robert L. Herrick, *Dept. of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, OH, USA*

Lusine Yaghjian, *Washington University, St. Louis, MO, USA*

Jeanette M. Buckholz, *Dept. of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, OH, USA*

James Nasuta, *Dept. of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, OH, USA*

Paul Succop, *Dept. of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, OH, USA*

Robert Wones, *Dept. of Internal Medicine, University of Cincinnati College of Medicine, Cincinnati, OH, USA*

Background and Aims: Ionizing radiation has been recognized as a risk factor for breast cancer in humans, but recently studies of mammary cell lines have noted that the heavy metals cadmium and uranium seem to exhibit estrogenic activity. We examined data from a longitudinal cohort to determine if breast cancer incidence was related to exposure to uranium and radiation in a population residing around the Feed Materials Production Center (FMPC), a uranium refinery in Fernald, Ohio.

Methods: The FMPC was part of the US Department of Energy (DOE) nuclear weapons complex, and produced uranium metal products from 1952-1989, with releases of soluble and insoluble uranium and ionizing radiation. The US Centers for Disease Control and Prevention (CDC) developed dose estimation models for exposures to individuals who lived within a 5-mile radius from the perimeter of the plant. We used these algorithms to estimate exposure for 4823 women enrolled in the Fernald Medical Monitoring Program (FMMP), of whom 184 were diagnosed with breast cancer during the 18 year tenure of the FMMP (1990–2008), and conducted life-table analyses, with appropriate covariates (age, family history of breast cancer, parity, age at first birth), to determine the relationship between uranium/radiation exposure and breast cancer incidence.

Results: The mean value of the uranium particulate exposure ($\mu\text{g}/\text{m}^3$ -years) for women in the three exposure groups was 0.086, 0.354, 1.596, and for cases was 0.738 vs. 0.614 for controls. The risk of breast cancer in the highest exposure group compared to baseline was significantly elevated ($\text{HR}=1.55$, 95% CI 1.12, 2.15). In the subgroup with age at first exposure ≤ 15 years the HR for the highest exposure group was 4.56 (1.93, 10.77).

Conclusions: For women living within five miles of a uranium processing plant, degree of exposure to uranium particulates was related to risk of incident breast cancer.

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